



Earth Venture-2 Announcement of Opportunity and Technical, Management, and Cost Evaluation

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Earth Venture-2 Preproposal Conference

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Introduction

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Purpose of this Presentation

1. Present to the community the Earth Venture-2 (EV-2) Announcement of Opportunity (AO) highlighting the “TMC Feasibility of the Mission Implementation, Including Cost Risk” criteria that are assessed by the Technical, Management and Cost (TMC) panel.

2. Answer questions.

Important Note: This AO incorporates a large number of additional changes relative to the Earth Venture 2 Draft AO, including both policy changes and changes to proposal submission requirements. All proposers must read this AO carefully, and all proposals must comply with the requirements, constraints, and guidelines contained within this AO.



Introduction

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Outline

- Introduction
- EV-2 AO Highlights
- Technical, Management, and Cost (TMC) Evaluation
- References
- Modifications after AO Release
- Questions



EV-2 AO Highlights

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General

- **This EV-2 AO is based on the Standard AO template.**
- **Requirements are identified, numbered, and specific.**
 - There are 90 requirements on the EV-2 AO at this time.
 - When subsections do not levy requirements they do not have numbered requirements.
 - Section 4.1 states– “The following policies will impose requirements on the selected mission, for which planning may need to be considered and described as part of the proposal process. These requirements are not levied on proposals.”
- **Evaluation Factors are identified, numbered, and specific.**
 - 4 factors for Science Merit
 - 5 factors for Scientific Implementation Merit and Feasibility
 - 5 factors for TMC Feasibility of the Mission Implementation, Including Cost Risk
- **Appendix B** has numbered requirements on Proposal Preparation
 - There are 68 specific requirements for the format and content of proposals



EV-2 AO Highlights

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Example Requirement

5.2 Technical Requirements

5.2.1 Complete Spaceflight Missions

The term “complete” encompasses all appropriate mission phases (see Section 4.1) from project initiation (Phase A) through mission operations (Phase E), which must include analysis and publication of data in the peer reviewed scientific literature, delivery of the data to an appropriate NASA data archive, and closeout (Phase F). The term “spaceflight missions” is defined as Earth orbital and deep-space missions; it specifically excludes suborbital missions (*e.g., via sounding rockets, balloons, and aircraft*).

Requirement 11. Proposals submitted in response to this AO shall be for complete science investigations requiring a spaceflight mission.



EV-2 AO Highlights

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Example Sections and Requirements

Section 5.2. Technical Requirements (11-25)

Section 5.3. Management Requirements (26-35)

Section 5.4. Science Team, Co-Investigators, and Collaborators Requirements (36-39)

Section 5.6. Cost Requirements (46-61)

Section 5.9. Program Specific Requirements and Constraints (73-84)

Section 6.2. Proposal Preparation and Submission Requirements (85-89)

Appendix B: Requirements for Proposal Preparation (B1-B68)

Appendix B contains the specific requirements for the format and content of proposals.



EV-2 AO Highlights

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Section 7 and Evaluation Factors

7. Proposal Evaluation, Selection, and Implementation

7.1 Overview of the Proposal Evaluation and Selection Process

7.2 Evaluation Criteria

7.2.1 Overview of Evaluation Criteria

7.2.2 Scientific Merit of the Investigation (4)

7.2.3 Scientific Implementation Merit and Feasibility of the Investigation (5)

7.2.4 TMC Feasibility of the Mission Implementation, Including Cost Risk (5)



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7.2.4. TMC Feasibility of the Mission Implementation, Including Cost Risk Evaluation Criteria

The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule. The factors for feasibility of mission implementation include the following:

Factor C1 - Adequacy and robustness of the instrument implementation plan.

Factor C2 - Adequacy and robustness of the mission design and plan for mission operations.

Factor C3 - Adequacy and robustness of the flight systems.

Factor C4 - Adequacy and robustness of the management approach and schedule, including the capability of the management team.

Factor C5 - Adequacy and robustness of the cost plan, including cost feasibility and cost risk.



EV-2 AO Highlights

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Major changes from the Draft AO to the AO.

- The organizations which will provide evaluation services to NASA for this AO have been specified (Section 4.2.1).
- Policy sections have been added describing orbital constellations (Section 4.5.5) and end-of mission requirements (Section 4.5.6).
- Proposals must demonstrate how the proposed investigation will fully achieve the proposed objectives (Section 5.1.1).
- Interface requirements for ISS-based investigations have been stated more explicitly (Section 5.9.4).
- Significant clarifications have been made in the description of constraints and requirements for proposing alternative access to space (Section 5.9.5).
- The requirement for selected PI-led teams to attend NASA's PI-led Team Masters Forum is explicitly stated (Section 7.4.2).
- All individuals affiliated with the proposed investigation without being listed as team members on the proposal cover page must be entered in NSPIRES (Appendix B, Section A.2).
- The Small Business Subcontracting Plan shall be provided in an appendix (Appendix B, Section J. 11).

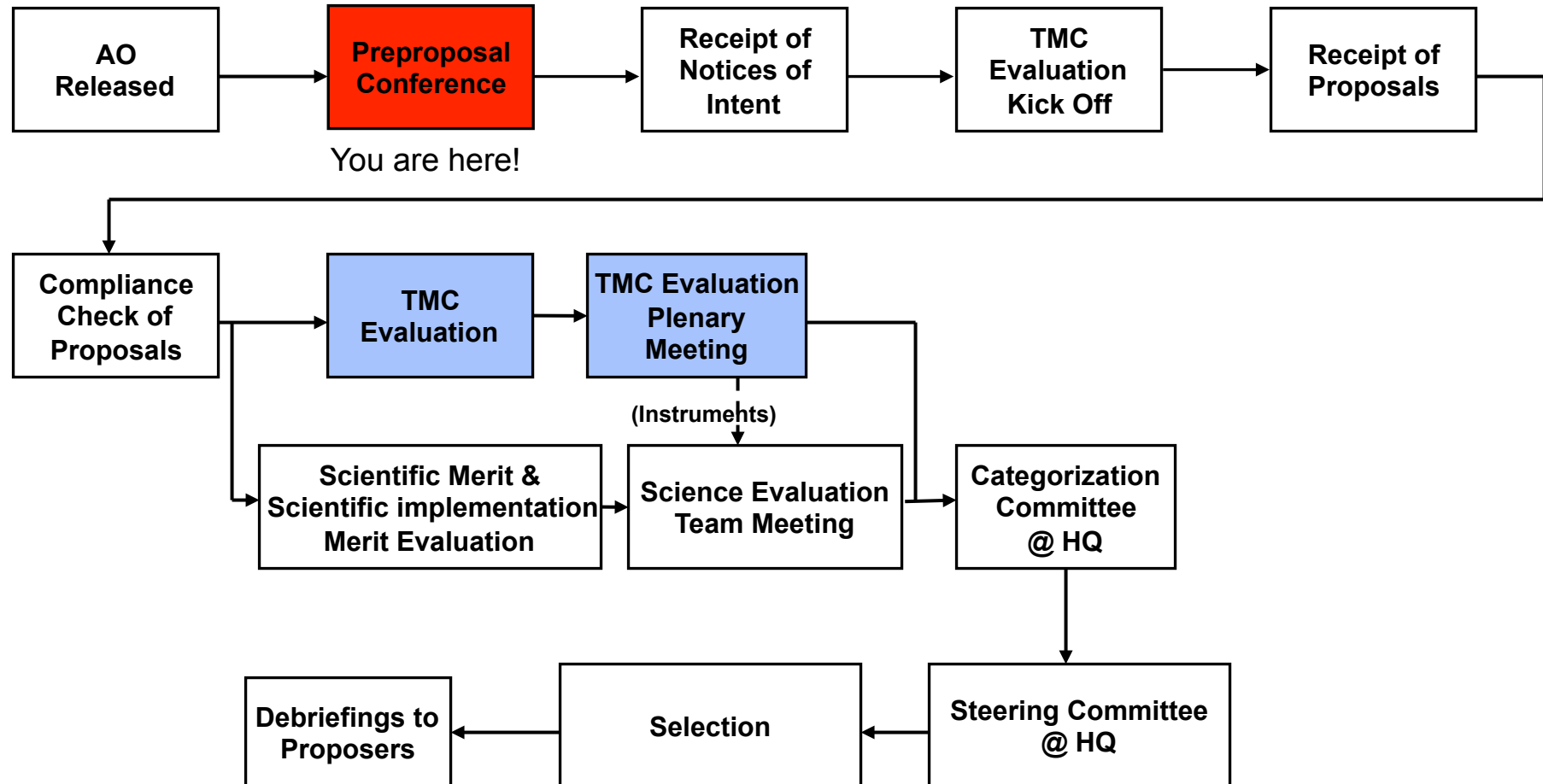
In addition to the listed changes, this AO incorporates a large number of additional changes relative to the Earth Venture 2 Draft AO, including both policy changes and changes to proposal submission requirements. All proposers must read this AO carefully, and all proposals must comply with the requirements, constraints, and guidelines contained within this AO.



TMC Evaluation

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Proposal Evaluation Process





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The **NASA Science Mission Directorate (SMD) Science Office for Mission Assessments (SOMA)** was established in 1996 by the Office of Space Science to support the Discovery and Explorer Programs, now also supports the New Frontiers, Mars Scout, Earth System Science Pathfinder (ESSP), and others. The TMC process is a standard process used by SOMA to support all SMD evaluations. Lessons learned from each evaluation are incorporated into the process for continuous improvement.

TMC Evaluation - The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule.

There are three possible Risk Ratings: Low, Medium, and High

Low Risk: There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation well within the available resources.

Medium Risk: Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Mission design may be complex and resources tight.

High Risk: One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.



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TMC Envelope Concept

Envelope: All TMC Resources available to handle known and unknown development problems that occur. Includes schedule and funding reserves; reserves and margins on physical resources such as mass, power, and data; descope options; fallback plans; and personnel.

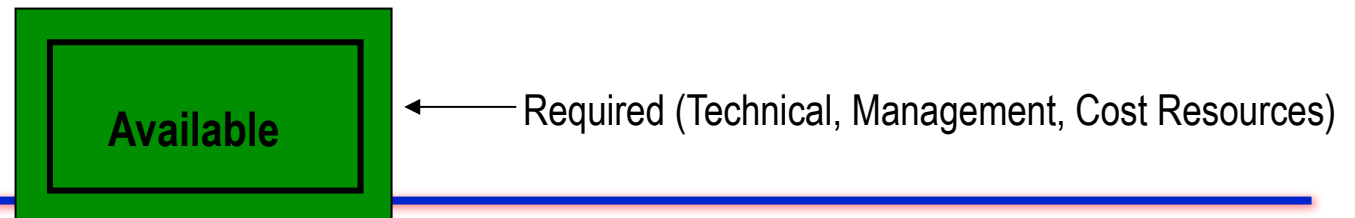
Low Risk: Required resources fit well within available resources



Medium Risk: Required resources just barely inside available resources.
Tight, but likely doable



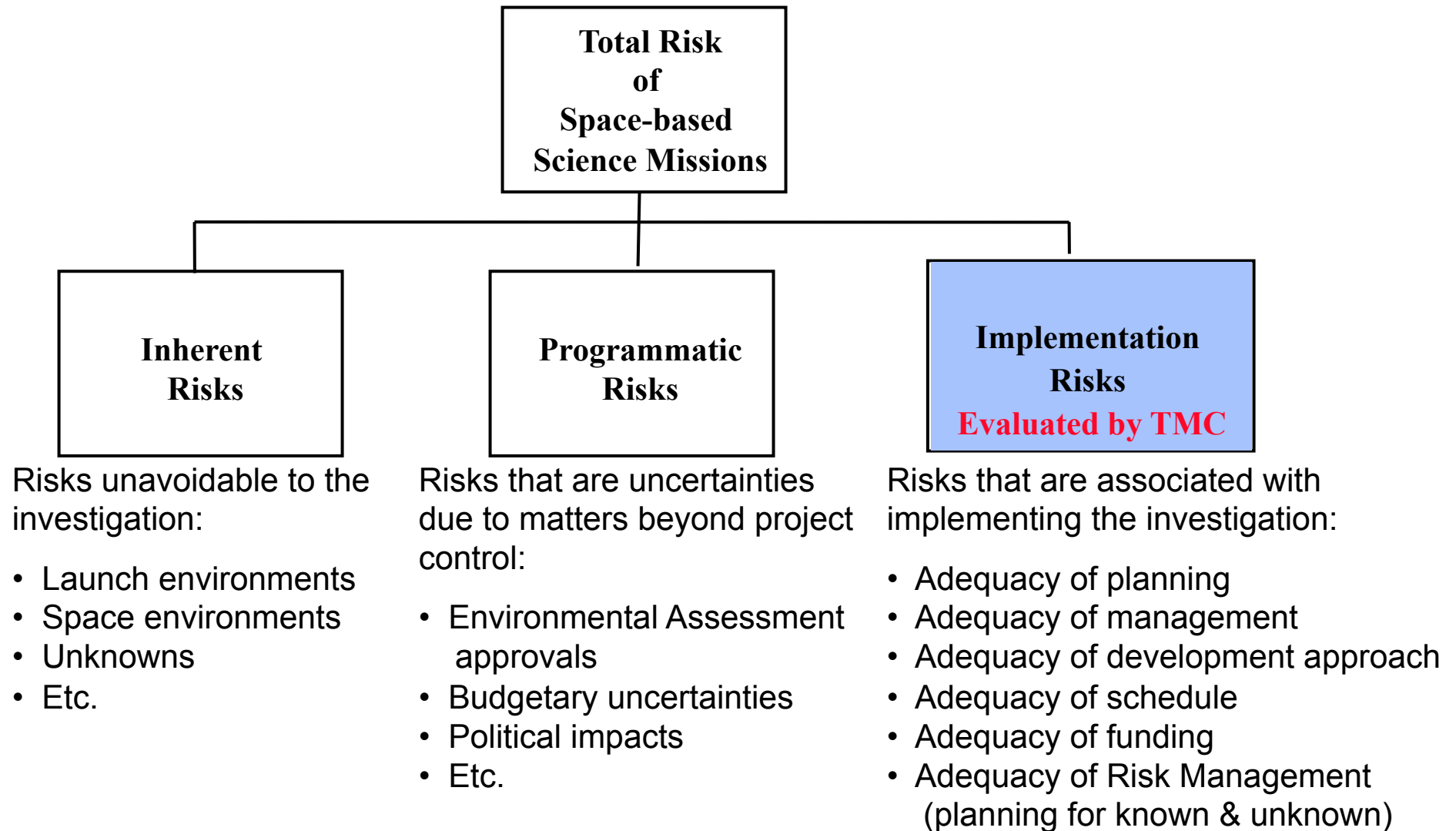
High Risk: Required resources DO NOT fit inside available resources.
Expect project to fail





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TMC Evaluation Principles

- **Basic Assumption:** Proposer is the expert on his/her proposal.
 - Proposer's task is to provide evidence that the investigation implementation risk is low.
 - TMC panel's task is to try to validate proposer's assertion of low risk.
- **All Proposals are evaluated to identical standards and not compared to other proposals.**
- **TMC Panels consist of evaluators who are experts in the areas of the proposals that they evaluate.**
- **TMC Panels develop findings for each proposal.**
 - Findings: "As expected" (no finding), "above expectations" (strengths), "below expectations" (weaknesses).
- **The Cost Analysis is integrated into overall risk.**
- **Proposal Risk Assessment:**
 - Proposals are based on Pre-Phase-A concepts; TMC Risk Assessments give appropriate benefit of the doubt to the Proposer.



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TMC Evaluation of Class D Payloads

Q: 29:Recently, the Explorer Program solicited missions with Class C payloads. EV-2 would solicit missions with Class D payloads. Are there different instructions given to the TMC panel to account for the differences?

A: Yes. The TMC panel is briefed on the evaluation criteria as well as mission category (per NPR 7120.5D NID) and payload class (per NPR 8705.4)

Steps for TMC Evaluations consistent with Class D Payloads

- Evaluators will be briefed on the Class D payload requirements
- Evaluators will review all findings for consistency with Class D payload requirements
- Form Leads will review all findings for consistency with Class D payload requirements
- NASA personnel will review all findings for consistency with Class D payload requirements (during the evaluation process and at categorization)



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Generally, the degree to which Proposals address the following areas, as applicable, directly relates to the rating of Low, Medium, or High Risk:

- **Instrument**
 - Instrument Design, Accommodation, and Interface
 - Design Heritage
 - Environment Concerns
 - Technology Readiness
 - Instrument Systems Engineering
- **Mission Design and Operations**
 - Mass Margins
 - Trajectory Analysis
 - Launch Services
 - Concept of Mission Operations
 - Ground Facilities – New/Existing
 - Telecom
- **Flight Systems**
 - Hardware/Software Design
 - Design Heritage
 - Spacecraft Systems Design
 - Design Margins (Excluding mass)
 - Qualification and Verification
 - Assembly, Test, and Launch Operations
 - Mission Assurance
 - Development of New Technology
- **Management and Schedule**
 - Roles and Responsibilities
 - Team Experience and Key Individuals' Qualifications
 - Project Management and Systems Engineering
 - Organizational Structure and Work Breakdown Schedule (WBS)
 - International Participation
 - Risk Management, Including Descope Plan and Decision Milestones
 - Project-Level Schedule
 - Proposed Subcontracting Plans and SDB Participation.
- **Cost**
 - Basis of Estimate (BOE)
 - Cost Realism and Completeness
 - Cost Reserves by Phase
 - Comparison with TMC Estimates (Including Parametric Models/Analogies)



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TMC Independent Cost Assessment

“The Pyramid”

Process Steps:

5. Overall Cost Risk

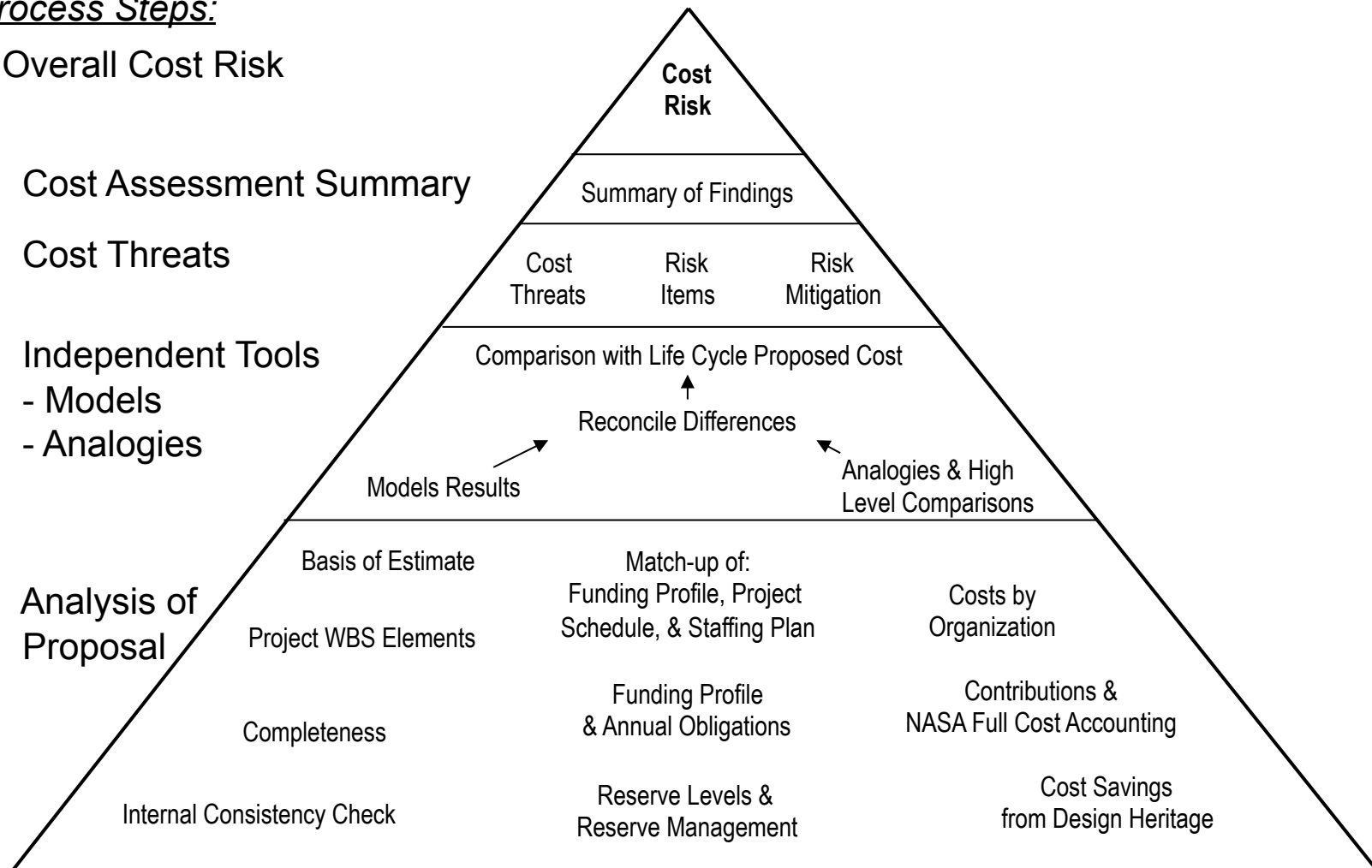
4. Cost Assessment Summary

3. Cost Threats

2. Independent Tools

- Models
- Analogies

1. Analysis of Proposal





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Typical TMC Evaluation Questions (1 of 2)

- Will overall investigation approach allow successful implementation as proposed?
- If not, are there sufficient resources (time & funds) to correct identified problems?
- Does proposed design/development allow the investigation to have a reasonable probability of accomplishing its objectives and includes all needed tools?
- Are requirements within existing capabilities or are advances required?
- Does the proposal accommodate sufficient resiliency in appropriate resources (e.g., funds, mass, power) to accommodate development uncertainties?
- Is there a Risk Management approach adequate to identify problems with sufficient warning to allow for mitigation without impacting the investigation's objectives?
- Does the proposer understand the known risks, including risk of using new developments, and are there adequate fallback plans to mitigate them, to assure that investigation can be completed as proposed?



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Typical TMC Evaluation Questions (2 of 2)

- Is the schedule workable?
- Does it reflect an understanding of work to be done and the time it takes to do it?
- Is there a reasonable probability of delivering the investigation on time to meet the proposed dates?
- Does it include schedule margin?
- Will proposed management approach (e.g., institutions and personnel, as known, organization, roles and responsibilities, experience, commitment, performance measurement tools, decision process, etc) allow successful completion of investigation? Is the PI in charge?
- Does the investigation, as proposed, have a reasonable chance of being accomplished within proposed cost?
- Are proposed costs within appropriate caps and profiles and does cost estimate cover all costs including full-cost accounting for NASA Centers?
- Are costs phased reasonably?
- Is there evidence in the proposal to give confidence in the proposed cost?
- Does the proposer recognize all potential risks/threats for additional costs or cost growth (e.g., late deliveries of components)?



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Characteristics of Low Risk Ratings

- All risks for the project have been/are being identified and managed by the team, with plans to reduce or retire the risk before launch.
- No risk exists for which either a workaround is planned, or a very sound plan to develop the risk item for flight.
- The proposed project team and each of its critical participants are competent, qualified, and committed to execute the project.
- The project will be self managed to a successful conclusion while providing reasonable visibility to NASA for oversight.
- The team has thoroughly analyzed all project requirements, and consequently the proposed resources are adequate to cover the projected needs, including an additional percentage for growth during the design and development, and then a margin on top of that for unforeseen difficulties.
- The schedule includes reserve time, to find and fix problems if things do not go according to plan.
- All contributed assets for the project are backed by letters of commitment.
- The team understands the seriousness of failing to meet technical, schedule, or cost commitments for the project in today's environment.



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Characteristics of High Risk Ratings (1 of 2)

Technical Design Margins (Mass, Power, etc.)

- Insufficient data provided from which to independently verify the margins.
- No margin provided or conflicting data provided.
- Margin provided deemed too low based on the maturity of the design.

Cost

- Concerns relating to cost reserve (Below AO requirement, too low based on liens/threats, phasing inconsistent with anticipated needs).
- Unable to validate proposed cost

Instrument Implementation

- Heritage claims not substantiated/development risks not adequately addressed.
- Inadequate/inconsistent description and detail.
- Inconsistencies between instrument requirements and bus capabilities.

Complex Operations

- More common in payloads containing multiple instrument that required tight scheduling/sequential operations. Operations not adequately addressed.



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Characteristics of High Risk Ratings (2 of 2)

Systems Engineering

- Incomplete flow-down of science requirements to payload/flight system accommodations.
- Incomplete description of how the systems engineering function will be executed.
- Inadequate resources allocated to accomplish this function.

Management Plans

- Confusing/conflicting organizational roles and responsibilities.
- Lack of demonstrated organizational/individual expertise for specified role.
- Insufficient time commitments for key personnel.

Schedules

- Insufficient detail from which to perform an independent assessment.
- Inadequate/no schedule reserve identified.
- Overly ambitious schedules that are not consistent with recent experiences.



References

Earth Venture-2 Acquisition Home Page

An EV-2 Acquisition Home Page, available at <http://essp.larc.nasa.gov/EV-2/>, will provide updates and any AO addenda during the EV-2 AO solicitation process. It will provide links to the EV-2 Library, information about the Preproposal conference, a list of potential teaming partners, and questions and answers regarding the AO.

EV-2 Library

The EV-2 Library provides additional regulations, policies, and background information on EV-2. The EV-2 Library is accessible at http://essp.larc.nasa.gov/EV-2/ev2_Library.html

Lessons Learned from Technical, Management, and Cost Review of Proposals 2nd Edition

http://sso.larc.nasa.gov/TMCLessonsLearned_Step1_Update_120409_2.pdf



Modifications after AO Release

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Modifications to Program Library:

- Documents Updated
 - 2011 NASA Strategic Plan (NPD 1001.0A)
 - ELV Launch Services Information Summary (Draft Update)
 - NPD 1360.2B
 - Proposal Summary Information (Updated)
 - Excel version of the template tables in the AO:
 - Table B3: Total Mission Cost Funding Profile Template
- Documents posted
 - U.S. Space Transportation Policy
 - Afternoon Constellation Operations Coordination Plan
 - Afternoon Constellation Contingency Procedures
 - End-of-Prime-Mission Review
 - 2011 Call Letter for ESD Senior Review



Questions